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USSR Report

TRANSPORTATION

No. 95

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NOTE

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USSR REPORT

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CONTENTS

BRIEFS

AEROBUS FLIES TO AMMAN--Moscow, July 5, TASS--A Soviet aerobus "IL-86" has left today for its maiden flight from Moscow to Amman. This summer the "IL-86" aerobus will make flights once a week. That the Soviet 350-seater now flies in the Soviet-Jordanian route is the result of growing cooperation between the two countries. Jordan is the first state in the Middle East to have Soviet wide-fuselage liners regularly flying to it. "IL-86" liners visited airports of 18 states over a year of their exploitation in international routes. [Text] [LD060140 Moscow TASS in English 1219 GMT 5 Jul 82]

CSO: 1812/175

VITAL LOCAL ROADS TO BE BUILT IN REMOTE GEORGIAN HIGHLANDS

[Editorial Report] Tbilisi KOMUNISTI in Georgian on 17 July 1982 page 3 has a letter to the editor from R. Elanidze, a senior scientist in the Academy of Sciences Zoology Institute, concerning plans to build local roads in the remote highland district of Tusheti, which is located north of the Caucasus Range in northeast Akhmeta Rayon. A main road has been built in recent years to connect the rayon center to Omalo, Tusheti's main town, but there have been no adequate connections with the smaller villages located in the two major river valleys there. This situation has hampered full utilization of the region's rich alpine pasturelands, and sheepraising products (valuable lamb's wool and cheese in particular) have been extremely costly to transport. Bringing the herds down to Akhmeta's lowlands has not been a very satisfactory solution. At present, one local road has been surveyed and project plans completed; the other is not yet drafted. The projected routes are given. When completed, these roads will help to revitalize Tusheti economically and socially.

CSO: 1813/744

TANK CAR SHORTAGE SEEN AS CAUSE OF FUEL DELIVERY DELAYS

Moscow GUDOK in Russian 25 Aug 82 p 1

[Editorial: "When the Car Is Carrying Fuel"]

[Text] The question of transporting liquid fuel and lubricants is more critical today than ever before. Fuel is needed everywhere. But the railroad system is not fulfilling the plan for shipping petroleum and petroleum products. As a result, in some parts of the country even agricultural machinery engaged in the harvest is experiencing a fuel shortage. At the same time many petroleum refineries (those in Bashkiria, the Novoyaroslavskiy, Novogor'kovskiy, Volgograd, and certain other refineries) have more finished output than they can handle and they are sometimes forced to curtail production.

Now is not the time to determine who is at fault for the breakdown in fuel shipment assignments. Neither the shippers nor the railroad workers have done their best. They have already fallen 1.8 million tons behind the assignment. The situation must be corrected quickly. This can only be done by combined efforts, mobilizing all available reserves. These reserves are far from being exhausted.

As a rule the most frequent point of loss of loading resources is in the unloading process. But this is not what is limiting loading today. The tankers are being held up for a long time for fuel removal at the Komsomolsk and Fergana refineries and a few other enterprises. But a large majority of the fuel recipients remove it quickly and in an organized manner.

Then what is the problem? Why is the system as a whole loading 600 tankers less than in August of last year? The whole point is the slowdown in car turnaround time. It is intolerably high today. It exceeds the assignment by 30 hours, more than a day.

There is one reason for this situation. A number of roads have slackened their attention to this scarce rolling stock and do not value its working time sufficiently. There are delays in shipping loaded cars, they travel slowly, they are distributed to unloading points even more slowly, and the collection and dispatching of empty cars is done very poorly. A few days ago tanker cars loaded with fuel waited 29 hours to be shipped off at Knyazevka on the Volga Road! They stood at the station for more than a day, and this did not particularly upset anyone. Some railroad workers still had not learned to look beyond their own shift,

station, section, or road. When they have loaded the car and reported it, their job is done.

But now suppose that the tankers have finally been sent off. Do they always go by through train? Not always, even in places where this is entirely possible. Sometimes they are even put in pick-up trains and then they spend long times at all intermediate and section stations. And even those which are included in through trains travel very poorly. It is no accident that 15,000-17,000 loaded transit tanker cars are on the roads of the system. This is evidence of serious miscalculations in operations work.

The urgent challenge today is to step up the movement of tankers. This challenge will be met better when the trains travel faster and the rate of car transfer at junction points is higher. This refers especially to the decisive directions. At the present time the number of cars being transferred at interroad junction points is 27,000 less than planned. The dispatcher apparatus must use all its train traffic control skills to accelerate their movement.

The operations workers are not the only ones who must help railroad cars be more productive. Certainly a great deal depends on their efforts and skill. But without effective and constant help from the employees of other services they will not be able to meet the challenge. Railroad workers in all occupations related to train traffic must understand the importance of this challenge. They must realize clearly that the slightest disruption in operations work — whether it is caused by friction in the axle-box, a broken rail, dropped freight, or a malfunction in the signaling and communications equipment — leads to losses that cannot be gotten back. The employees of the locomotive services of the Alma-Ata, Transbaikal, and Volga roads need to be put under special watch. Train runs are being slowed down over entire directions [napravleniya] because of the unsatisfactory condition of diesel locomotives. The transit surpluses on roads in these regions are intolerably large, and this includes surpluses of tanker cars. There are 4,000 on the roads of Kazakhstan and Central Asia and 2,000 on the East Siberian Transbaikal roads. Many tanker cars are also being held up in transit on southern roads, Odessa, Southwest, Southern, and North Caucasus. Thousands of cars already filled with scarce petroleum products are wasting time at the stations and sections; in reality they are excluded from useful work. We cannot tolerate this further.

But now suppose, finally, the car has reached the unloading road. We would expect that its route to the unloading point would be wide open. But a number of roads have not organized prompt unloading. There are cases where the unloading areas are empty even though the long-awaited fuel is just a few kilometers from its destination point. The roads of the railroad system are holding 4,000 tanker cars above the norm in local freight, and one-quarter of them are on the Central Asian Road. There are also large surpluses on the Far Eastern, Alma-Ata, and certain other main roads. Placement and unloading of tanker cars is also poorly organized on the October, Odessa, and Southeast roads.

But if loaded tanker cars are delayed, where will we get empty ones? And so the fuel-shipping roads are on starvation rations. The Gorky Road, for example,

receives just 380 cars instead of the planned 635, while the Northern Road gets 580 instead of 925. The situation is similar on the Kuybyshev, Volga, and Sverdlovsk roads. These key roads are not fulfilling the fuel loading plans. A considerable portion of the blame for this goes to the railroad workers of the Baltic, October, Southwest, Odessa, Alma-Ata, Central Asian, and Transbaikal roads who are violating established norms for turning over empty tankers. It is high time to call those who are violating control discipline and putting local interest above state interest to a strict accounting.

The scope of harvest work is broadening every day. Where the harvest has been gathered fall plowing and other field jobs are underway. The need for fuel and lubricants is rising sharply. The most important task of railroad workers is to completely meet these needs and insure uninterrupted transportation of petroleum products. This can only be done by a radical improvement in the use of tanker cars. Above all this means accelerating the movement of both loaded and empty cars. Through trains carrying fuel should have priority over all other freight trains. This is a law of transportation and it must be strictly followed.

Each tanker car should be subject to special accounting and special control along the entire technological cycle from loading to arrival at the point of destination and from unloading until it returns to the fuel loading place. This is the only way we will be able to create the necessary reserves of cars. This is the only way we will be able to handle the assignment for shipping petroleum products. And this must be done immediately, without losing a day or an hour.

11,176
CSO: 1829/315

RAILROAD

HARVEST DELIVERY PROGRESS REPORT

Moscow SEL'SKAYA ZHIZN' in Russian 31 Jul 82 p 1

[Article by V. Delyukin in the column "Topic of the Day": "Give the Harvest the Green Light!"]

> [Text] This is a busy time for railroad workers. Trains carrying the new harvest are traveling the roads day and night. In the article below important officials of the USSR Minister of Railroads tell how the shipment of agricultural freight has been organized.

V. F. Krylov, Deputy Chief of Administration

Shipment of agricultural output by rail is growing year after year, and more and more freight is being delivered to the countryside. Suffice it to say that this shipping accounts for more than 15 percent of all railroad shipping. It is more than 525 billion ton-kilometers.

The resolutions of the May 1982 Plenum of the party Central Committee and implementation of the Food Program placed important challenges before USSR railroad workers. By 1990 the shipment of freight from the agroindustrial complex will increase significantly and make up one-fifth of all freight turnover.

Railroad workers consider their paramount task to be prompt, regular delivery of fully preserved freight with minimum expenditures. The most pressing and urgent assignment today is to deliver the 1982 harvest precisely and without losses. The slogan "Model Transportation Service for the Countryside" has found support on all the railroads of the country.

In the first six months of the year the railroad collectives generally handled the planned volume of shipment of the most important types of agricultural output and food. The volume of the shipping was more than 84 million tons.

Plans envision shipping more than 190 million tons of agricultural output this year, 8.6 million tons more than in 1981. According to preliminary figures, grain shipment will increase by almost 1 million tons and sugar beets by 9 million tons, while deliveries of fruits, vegetables, melons, and potatoes will increase.

Last spring the Collegium of the Ministry of Railroads made a detailed review of work to prepare road systems for shipment in light of work to implement the Food Program. Preparation for shipping this year's harvest was completed. Concrete steps to increase the working reliability of technical equipment were taken on the roads with large-scale shipping of grain, fruits, and vegetables. The fleet of locomotives was built up, and rolling stock was relocated with due regard for the times and volumes of upcoming shipping. The necessary number of boxcars and refrigerator cars was assembled on the main lines. More than 280 comprehensive car preparation points and about 30 disinfection-washing stations were set up. Practically all freight arriving at farms in open cars today is unloaded by mechanized teams. Refrigerator trains, sections, and cars have replaced the old ice cars. All shipments of meat and dairy products, perishable vegetables and fruits, and citruses are now done by this kind of modern rolling stock.

Plans envision using 19 more regular-route express freight trains than in 1981 in order to speed up the delivery of fruit and vegetables. The shipment of early vegetables was completed quickly this year. About 500,000 tons of cabbage was shipped from the southern regions of the country, plus more than 170,000 tons of tomatoes from the Central Asian republic and Azerbaijan, and 50,000 tons of early potatoes from Georgia and Uzbekistan. Large-scale shipment of vegetables and melons from the republics of Central Asia and the Transcaucasus, Moldavia, and the regions of the North Caucasus and Volga is continuing.

The challenge is to see that agricultural output reaches its destination on time, is not held up en route, but gets to the counters of the stores as quickly as possible.

N. I. Kornyushin, Deputy Chief of the Department of Agricultural Freight Shipment

The main types of agricultural shipping are grain and its milling products. According to preliminary figures, 19.8 million tons of grain will have to be delivered in the third quarter, which is more than last year's shipping volume.

August is the most important month for grain shipment. Analysis of last year and this year's request by the USSR Ministry of Procurement indicates that during the peak time it will be necessary to allocate 900 cars a day more for grain shipment than in 1981. Plans envision delivering more than 3,500 cars a day. This should completely insure timely grain shipment.

Mass movement of grain in the new harvest was already underway during the last 10 days of June on the North Caucasus, Dnepr, and Odessa roads. The average daily shipment of grain on these roads reached 1,200 cars. All grain shipments are being carried out according to plan.

To support a high rate of harvest work in these regions more than 750 through trains carrying motor vehicles and other equipment were sent there.

We are preparing carefully for the time when grain will start coming from the Southern Urals, Kazakhstan, and Siberia. Tens of thousands of trucks, a significant amount of other agricultural equipment, and a large amount of fuel and lubricants will be delivered there by rail for conducting the harvest.

But as last year showed, at the peak of shipping not all procurement and trade organizations were ready for mass shipment and receiving of agricultural output. This leads to long delays for rolling stock. The numbers of cars not unloaded at enterprises of the Ministry of Food Industry and USSR Ministry of Fruit and Vegetable Industry has increased. The condition of the grain-receiving points is especially alarming. Inspections of the sidings at these enterprises revealed that only 1,613 of the 2,760 grain-receiving points were ready. The volume of grain shipment in specialized grain cars has been increasing recently. But there are still very few points which can receive these cars and their unloading areas are inadequate. Extra transportation work is sometimes done because of irrational shipment of agricultural freight.

Thus, mass shipment of the harvest has begun. The railroad workers of the country are laboring under the slogan "Model Transportation Service for the Countryside!"

11,176
CSO: 1829/315

OCEAN AND RIVER

CABLE SHIP, CATAMARANS ORDERED FROM FINNISH SHIPYARDS

Moscow MORSKOY FLOT in Russian No 6, Jun 82 p 47

[Article: "Cable Ship and Catamarans"]

[For complete translation see: JPRS 81566, USSR REPORT: ENERGY, 18 August 1982, No 111]

CSO: 1822/222

OCEAN AND RIVER

MORE ON THE NUCLEAR-POWERED LIGHTER CARRIER

Moscow MORSKOY FLOT in Russian No 8, Aug 82 pp 41-47

[Article by N. Rodionov, V. Vorob'yev and F. Gabaydulin: "Technical Operation: New Addition to the Fleet: The Nuclear-Powered Lighter Carrier"]

[Excerpts] The Soviet shipbuilding industry is working to create the first nuclear-powered icebreaker-transport lighter/container carrier in the country with a displacement of some 61,000 tons. This is the practical implementation of 26th CPSU Congress resolutions, which envisaged beginning the outfitting of transport vessels with nuclear-propulsion plants.

The successful experience of operating nuclear-powered icebreakers proved the advantages of nuclear power engineering for large power output under Arctic conditions and confirmed the high reliability of equipment being used. Therefore the choice of the nuclear-propulsion plant for a vessel, the primary purpose of which is to transport cargoes in the Arctic region, is a logical continuation of the technical direction which has been taken.

During the design process there was a detailed study of the interaction of the vessel hull with ices under various ice conditions and of the ice-strengthening of the propulsion system. Redundant testing was performed on models of different scales in ice basins of AANII [Order of Lenin Arctic and Antarctic Scientific Research Institute] and of the Wärtsilä firm (Finland), which confirmed estimated values of the vessel's passage through ice and permitted evaluating and analyzing the stresses arising and working out the extent of ice-strengthening of the screw and nozzle.

The ship's arrangements have specific features contingent on the vessel's purpose. Above all this concerns the arrangement for mooring lighters in the process of cargo-handling operations. The fact is that a transom stern is put on conventional lighter carriers (not intended for ice navigation) and in the process of conducting cargo-handling operations it is always sufficiently submerged in the water, which ensures that the lighters rest against the transom and prevents them from getting under the vessel's stern when there is wave action.

But this traditional solution is completely unacceptable for an ice-navigation vessel inasmuch as it does not permit the vessel to go astern in ice. It is for this reason that the stern lines were given a spoon shape which

helps move aside the ice floes in going astern, and this is why the lower section of the transom was raised 2 m above the waterline. This created a problem of lighters resting against the stern and being centered aft before they are gripped by the crane spreader.

A special arrangement was developed to solve this problem, the basis of which is a panel that can be raised and lowered and has shock absorbing and centering components. With the vessel under way this panel will be in a raised position, and when anchored while conducting cargo-handling operations the panel is to be lowered and perform functions of a submerged transom of a conventional type of lighter carrier.

In the category of specific features also is an arrangement for thawing the fittings of covered lighters, which consists of a set of warming hoods of special design installed on ice-covered fittings by the crane spreader in advance before the beginning of cargo-handling operations.

The primary arrangement of the vessel--cargo-handling gear--includes a gantry crane with a hoisting capacity of 500 tons, which is used for loading and unloading lighters. The vessel will carry 74 lighters.

Primary Characteristics of the Lighter

Length: 18.7 m

Width: 9.5 m

Height: 4.3 m

Extreme draft: 2.6 m

Deadweight: 370 tons

The vessel also will be able to carry 1,336 20-foot containers corresponding to ISO [International Standardization Organization] standard. When the vessel is being loaded with containers cargo-handling operations will be supported by shore cargo-handling equipment.

Two cranes with a hoisting capacity of 16 tons each have been installed on the side in the vicinity of the steam generating plant (PPU) hatch to support the recharging of the plant as well as for transporting parts during repair work. One of the cranes lowers overboard and hoists the crew's launch, work boat and work raft. Two cranes with a hoisting capacity of 3.2 tons each are located on the bow side of the deck house for loading provisions, supplies and expendable materials.

The vessel's propulsion plant includes steam turbine and steam generating parts and is accommodated in two compartments: engine and boiler compartment and reactor compartment. The main engine with servicing machinery and systems, the primary and reserve electric power plants, as well as the boiler plant for emergency speed are accommodated in the engine and boiler room on two platforms and in the hold.

The nature of proposed vessel operation, including both independent operation in Arctic ice as well as lengthy work in clear water, places demands on the propulsion plant on the one hand for higher maneuverability and great overload capacity in the turning moment typical of icebreakers and icebreaker vessels and, on the other hand, a demand for high thermal efficiency at outputs close to nominal which is specific for line transport vessels with an unrestricted navigating area.

A comparison of possible variants of the plants showed that these requirements are met most fully by using a geared-turbine unit (GTZA) with a direct transmission of power to the VRSh [controllable pitch propeller] as the main engine. The main geared-turbine unit is a double-casing turbine with three regenerative steam bleedings, with a single-pass, dual-flow condenser and with a double-reduction, eight-flow gear. The GTZA also includes a jacking engine, clutch, main-thrust bearing, maneuvering gear and regulation and protection controls. The GTZA steam pressure ahead of the maneuvering gear is 3.6 megapascals, the steam temperature is 285°C, estimated temperature of outside water is 24°C, and specific consumption of steam (in the conditional regime) is 5.07 kg/kw-hours.

The high pressure turbine (TVD) is a seven-stage, impulse turbine with nozzle regulation: two groups of nozzles are provided, one of which supports the unit's operation in the power range of from 0 to 70 percent of nominal, and the other group switches in in the power range from 70 to 100 percent of nominal. The low-pressure turbine (TND) is a double-flow reaction turbine with eight stages in each flow. A louver type steam separator is included between the TVD and TND cylinders and maintains steam humidity ahead of the TND of no more than 0.5 percent. Use of the intermediate separator as well as intracylinder moisture separation envisaged by the design ensures that steam humidity is maintained within tolerable limits in the final stages of the TND, which is necessary for achieving the unit's requisite service life characteristics.

The power is distributed between the TVD and TND in the ratio of 1:1. Operation of the GTZA is possible, if any of the turbines malfunction, to ensure the vessel's movement under emergency conditions, and here the output of the turbine remaining in operation is 9.2 megawatts.

The unit's condenser is of a single-pass surface type with two parallel bunches of tubes and double tube plates. It is cooled with outside water supplied by two circulating pumps delivering 5,000 m^3/hr each. There is a recirculation tract at the water discharge after the condenser by which the temperature of cooling water is regulated at the pump intake by discharging a portion of the water after the condenser into the interbottom overflow. Despite the presence of the VRSh, an astern turbine has been retained as a reserve in the GTZA, providing shaft power equal to 40 percent of the ahead power.

The cycle diagram of the steam-turbine plant was chosen based on the condition of ensuring maximum reliability with the given requirements on its economy, which were dictated above all by the need to ensure a two-year operating

period between fuel rechargings with specific values of the reactor core energy reserve, an average annual operating period for the vessel's use, and an average annual operating power of the plant.

The basic diagram uses developed regeneration ensuring the heating of feed water to 170°C in the low-pressure heater deaerator, and high pressure heater by steam of the GTZA bleeds and exhaust steam from the turbine feed pumps. The total steam consumption at the unit's nominal operating condition is 205 tons per hour, which corresponds to a KPD [efficiency] of around 23 percent. When the steam turbine unit systems were formed particular attention was given to ensuring a reliable supply of feed water to the PPU's steam generators and an uninterrupted supply of steam to the turbogenerators of the electric power plant.

Feed water is supplied to the PPU by three main turbine feed pumps, one of which is a reserve. Each of the three pumps has a capacity which ensures operation of the PPU in the nominal regime. A reserve and two emergency electric feed pumps are provided as part of the feed system for the possibility of starting the plant and for its cooling. The emergency pumps supply feed water to the steam generators through pipes independent of the main feed line with the intake of water from the distillate reserve tank. The make-up and layout decisions of the system listed above ensure safe operation of the plant with any chance malfunction of single pieces of equipment, fittings and pipes. The system for steam supply to the turbogenerators is made as a ring circuit with the possibility of shutting off any damaged sector of the steam line with the help of fittings.

The plant's electric power system includes primary, reserve and emergency supplies of power. The main electric power plant consists of three turbogenerators with a capacity of 2 megawatts each with mounted condensers and with their own circulation and condensate pumps.

Two automated diesel generators with a capacity of 600 kw each and with a time of 20 seconds for receiving a load from a cold state are used as reserve sources of electric power. The emergency electric power plant consists of two diesel generators with a capacity of 200 kw each with automatic starting in 10 seconds. To ensure the vessel's reliable power supply under various operating conditions, including emergency conditions, sources of electrical power are accommodated in accordance with the principle of a physical separation. The reserve diesel generators are located in separate spaces on each side and the emergency electric power plant is remoted to the forward house.

This same principle is the basis for accommodation of main distribution panels providing control and monitoring of the operation of primary and reserve power sources. Each panel is accommodated in a separate space, isolated from each other and from the engine and boiler room space by fireproof bulkheads.

An emergency propulsion boiler accommodated in the bow portion of the engine and boiler room operates the steam turbine plant and general systems with the PPU inoperative. The boiler's capacity is 50 tons per hour, steam pressure is 2.5 megapascals, steam temperature is 355°C and fuel consumption is 3.9 tons per hour.

The GTZA capacity is 6.2 megawatts in the mode of operation from the emergency propulsion boiler, and this gives the vessel a speed of more than 10 knots. In addition to supply of steam to the main engine, in this mode steam also is supplied to one turbogenerator and important general ship users.

The design of the PPU and systems supporting its operation was accomplished with consideration both of Soviet experience in creating a nuclear-powered icebreaker fleet as well as international concepts which have taken shape as of the present time for ensuring the safety of nuclear-powered transports as set forth in the form of the IMCO Code for the safety of nuclear-powered merchant vessels.

The primary equipment of the single-reactor PPU is practically fully standardized with equipment of nuclear-powered icebreakers. The steam generating plant with a thermal output of 135 megawatts produces 215 tons per hour of superheated steam at a temperature of 290°C and a pressure of 4 megapascals.

The PPU's reactor unit, consisting of a reactor, four steam generators and four primary pumps connected by short power pipes, is fastened to the upper cover of the iron and water shielding tank. In addition to the reactor and steam generators, the caissons of this tank also accommodate pressurizers, two primary filters and a filter condenser.

The design of the primary equipment and its configuration in the unit have undergone practically no change in comparison with similar equipment and its configuration in the PPU of the icebreakers "Lenin" and "Arktika."

Features of the power plant of the icebreaker-transport lighter/container carrier must be said to include changes in design of biological shielding, new layout decisions for safety systems, and principles of forming the protective barriers of the PPU, which are a result of fulfilling requirements of the IMCO Code.

Biological shielding from sources which determine the radiation situation was chosen based on the condition for ensuring regulatable radiation levels in spaces being serviced, at control stations and on the vessel's outer surfaces not only with normal plant operation, but also under conditions of serious emergencies including loss of seal in the primary circuit.

With the lighter/container carrier's reactor unit functioning normally, acceptable radiation levels are as follows: frequented spaces of the reactor compartment--$0.78 \cdot 10^{-8}$ electron-volts per second; engine and boiler room and TsPU [primary control station]--$0.166 \cdot 10^{-9}$; exposed parts of the upper deck and external surfaces of sides in the reactor compartment area (at 30 percent power of the plant)--$0.55 \cdot 10^{-10}$; forward superstructure space--$0.3 \cdot 10^{-10}$; beneath the vessel's bottom in the area of the reactor compartment (with 10 percent power of the plant)--$0.21 \cdot 10^{-8}$ electron-volts per second.

Estimated radiation levels in the spaces are considerably below those permissible.

In accordance with the IMCO Code the design provides for creation of four safety barriers between the nuclear fuel and the surrounding medium. In addition to the conventional two barriers for water-cooled reactors (fuel jackets and the primary circuit strength limits) two more have been introduced: a containment envelope with its safety systems and a protective shield.

The containment envelope is the third protective barrier. Strength characteristics were estimated and requirements for its tightness were determined based on the condition of ensuring localization of two extreme design accidents: seal failure for the full cross-section of the Du 70 line in the "reactor-pressurizer" circuit (the most extreme accident possible) with the medium within the containment envelope being a water-steam-air mixture (with a pressure of 0.5 megapascals and a temperature of 135°C); and flooding of the ship in deep water with the medium outside the containment envelope being sea water with the following parameters: a pressure of 0.8 megapascals and a temperature of 4°C.

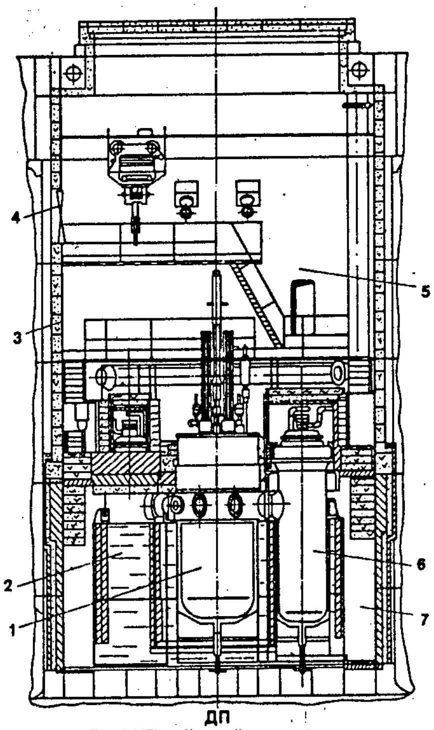
The design of the containment envelope consists of flat sections of high-tensile sheet steel 35 mm thick with vertical stiffening ribs. The inner space of the envelope is divided into two spaces in height by sealed decking: a reactor room and an equipment room. All equipment of the primary circuit is located in the reactor room under biological shielding made in the form of removable blocks. The plug and socket units for the equipment having replaceable elements are led into the equipment room, which precludes disassembly of protective blocks and loss of seal of the reactor room when it is replaced.

Personnel entry into the reactor and equipment rooms is through airlocks fitted with pressurized doors with interlocks precluding their simultaneous opening. For repair work and recharging of the fuel core the cover of the containment envelope has a hatch cover which provides an opportunity for vertical transporting of the primary circuit equipment being replaced. The hatch cover is sealed with a joint weld.

The doors, hatch cover, as well as openings for lines and cable junctions are figured for the very same parameters of strength and tightness as the containment envelope.

The containment envelope is ventilated by a self-contained system providing for operation both in a closed and open cycle. Operation in the closed cycle is accomplished through the air cooler, where the cooling medium is fresh water releasing heat in the refrigerating unit. Fine filters calculated for a full rate of flow and switched in on detection of contamination of the air within the containment envelope are installed in the bypass of the system's exhaust circuit. Automatic quick-closing valves are installed in the system's exhaust and intake ducts to cut off the containment envelope in emergency situations at the signal that pressure of the medium has increased to 8 kilopascals.

All aforementioned measures for sealing off the containment envelope preclude the possibility of an uncontrolled discharge or inadmissible leaks of radioactive substances into spaces adjacent to the containment envelope or into the



[longitudinal plane]

Steam generating plant in containment envelope:

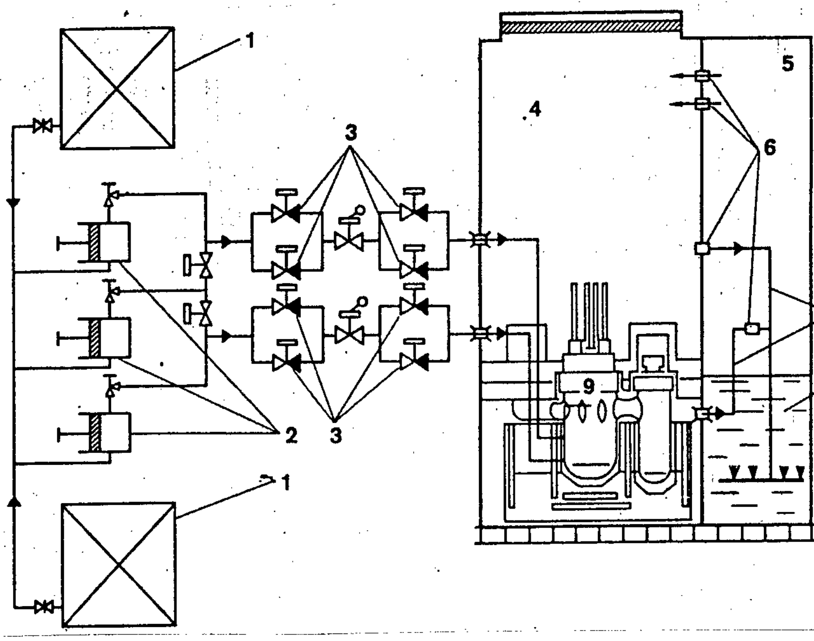
1. Reactor
2. Tank
3. Containment envelope
4. Emergency exit
5. Equipment room
6. Steam generator
7. Reactor room

Conventional symbols:

	steel		lead
	water		heat insulation
	concrete		polyethylene

environment under any emergency situations involving a loss of seal in the primary circuit, including the most extreme emergency possible.

A system for reducing emergency pressure and a system for fuel core emergency flooding are provided by the design to reduce consequences of the most extreme emergency possible under extraordinary circumstances. The system for reducing emergency pressure provides for passage of the steam and air medium formed in an emergency from the containment envelope spaces into a cofferdam through the bubbling tank. Pressure of the medium within the containment envelope drops because of the increase in volume of the emergency space and condensation of steam during bubbling. The safety plugs function with an increase of pressure in the reactor or equipment room to 0.15 megapascals and



Emergency fuel core flooding system and system for reducing emergency pressure in the containment envelope:

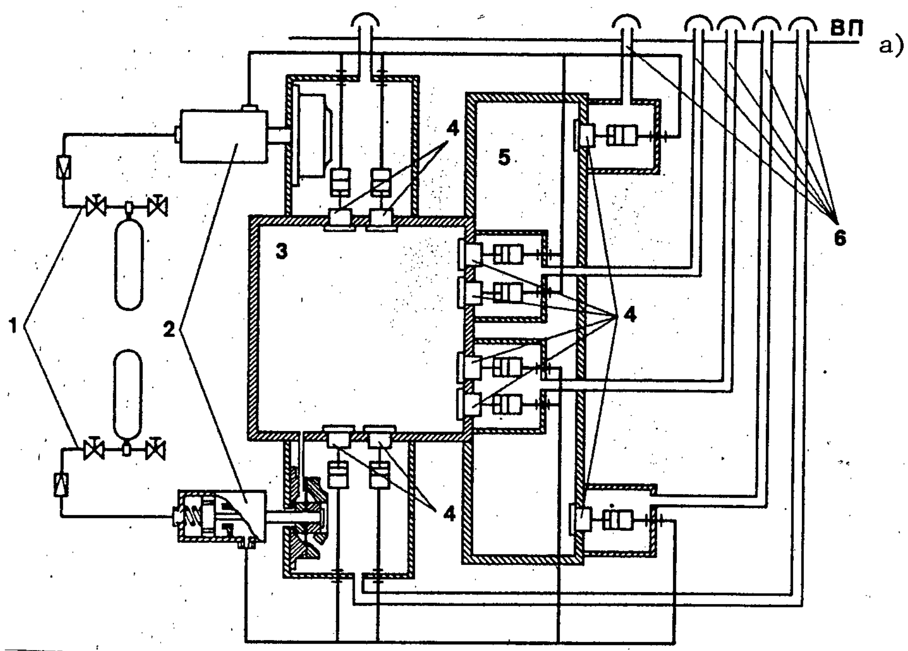
1. Feed water reserve tank
2. Flooding pump
3. Emergency flooding valve
4. Equipment room
5. Cofferdam
6. Safety plugs
7. Overflow ducts
8. Bubbling tank
9. Reactor room

the steam and air mixture goes to the bubbling tank built into the cofferdam through the overflow ducts. The system permits limiting pressure in the containment envelope to 0.18 megapascals with the most extreme emergency possible and reducing the content of radioactive aerosols in the gaseous medium.

The fuel core flooding system is intended for supplying water to the primary circuit in the most extreme emergency possible with a delivery rate precluding exposure of the fuel core. The system consists of three flooding pumps with a capacity of 20 m^3/hr each and a delivery pressure of 10 megapascals. At a signal indicating a drop of pressure in the primary circuit two flooding pumps are activated, taking water from the two feed water reserve tanks and supplying it to the primary circuit through two autonomous mains via two full-pass valves installed in parallel on each main. In case one of the pumps does not start, the third reserve pump starts automatically and is connected to the main of the unit which did not start. The fuel core emergency flooding system allows the prevention of destruction of the fuel jackets of the first safety barrier and thus substantially restricts the escape of radioactive fission

products from the fuel to the coolant and then into the containment envelope space.

In accordance with the IMCO Code the containment envelope also is a barrier to the propagation of radioactive fission products from the fuel core into the environment during emergencies which result in flooding of the vessel. To preserve integrity of the containment envelope with flooding of the vessel, the inner volume of the containment envelope and cofferdam is filled with outside water from external pressure.



Containment envelope flooding system:

1. Actuating air system — a. upper deck
2. Manipulator
3. Containment envelope
4. Flooding valve
5. Cofferdam
6. Intake ducts

Flooding is accomplished by a special system consisting of ten flooding valves with pneumatic drives operating from an independent actuating air system. The valves are opened automatically with an increase in outside water pressure in the vicinity of the intake ducts on the upper deck to a value of 0.05 megapascals. After the vessel settles to the bottom and pressure is equalized inside and outside the containment envelope the flooding valves close and inside space of the containment envelope and cofferdam is sealed, preventing a mass exchange between the activated medium in the containment envelope and external water masses.

The filling of the containment envelope also permits removal of afterheat from the fuel core when the vessel is flooded under conditions of a total absence of sources of electrical power. In this case the fuel core cooling channel includes the natural circulation of the primary circuit coolant, heat transfer from the coolant to outside water filling the reactor space of the containment envelope, and the natural circulation of the latter with heat transfer through walls of the containment envelope to the surrounding medium.

The fourth protective barrier--the protective shield--is intended to prevent propagation of radioactive substances from all sources to other parts of the vessel. The limits of protective shielding are the longitudinal and transverse bulkheads of the reactor compartment, the third bottom and decking of the upper deck in the area of the reactor compartment. In accordance with the IMCO Code it completely surrounds the containment envelope and all real sources of radioactivity. Equipment of the auxiliary circuits of the reactor unit, important equipment of the safety and electrical power distribution system, as well as equipment for the system of collection, storage and removal of liquid and solid radioactive wastes is located on four platforms and the third bottom in the protective shielding space. All rooms in the protective shielding are divided into conditional zones in conformity with the IMCO Code for purposes of preventing the spread of radioactive substances beyond their limits, the zones being: monitored, observed, and free. Passage into the monitored and observed zones is through a compulsory medical check point with a complete change of clothing and personal cleansing of the personnel servicing reactor unit equipment.

Radiation monitoring aboard the vessel is accomplished by a special system which provides continuous technological monitoring of the unit, monitoring of the radiation situation aboard the vessel and data processing. Dosimetric and radiation instruments perform tasks of individual radiation monitoring of the personnel, monitoring of the activity of solid and liquid wastes, radiometric analyses of the circuit mediums and so on.

The detailed analysis of emergency situations with the vessel and unit performed in the design, based on data of experimental research of safety systems and model trials of the vessel's behavior in emergency conditions, showed that the circuit and design solutions for the systems, biological shielding and safety barriers, and the organizational measures for ensuring medical inspection conditions in combination with the up-to-date system of radiation monitoring satisfy the highest requirements for ensuring safety placed on nuclear-powered transports both here and abroad.

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EXTENSION OF NAVIGATION

Moscow RECHNOY TRANSPORT in Russian No 7, Jul 82 pp 9-11

[Article by I. Korolev, Deputy Chief of the Main Administration of Shipments and the Operation of the Fleet, MRF [Ministry of River Fleet]; Candidate of Technical Sciences V. Tronin; and Engineer V. Malinovskiy (GIIVT) [Gork'iy Institute of Water Transportation Engineers], under rubric "Operation of the Fleet and Ports": "Prolongation of the Navigation Season: Results and Prospects"]

[Text] In conformity with the decisions of the 25th and 26th CPSU Congresses, the MRF is carrying out systematic work to increase the period for shipments of cargo by using the transportation fleet under icy conditions. For this purpose a program for prolonging the navigation season has been developed and is being implemented. That program includes the conducting of scientific research and development on experimental models of technical means to guarantee the operation of the fleet, the ports, the handling equipment, and the hydraulic and ship-repair structures under icy conditions and when the air temperatures are below freezing. The scientific-research and experimental-design projects aimed at prolonging the navigation season have been put into an independent area, and that has increased their purposefulness and planned nature.

In conformity with the established assignment, the Ministry of River Fleet in the winter of 1978-1979 carried out experimental shipments of cargo from the ports of the Caspian Sea to Astrakhan' and Volgograd. Experimental shipments of crushed stone are being made during the winter period at the Kuybyshev Reservoir for the purpose of working out the technical resolutions and technological methods to be used during the prolonged navigation season.

The work of river transport under icy conditions was widely discussed by specialists in production and at scientific and design organizations at a seminar in Kuybyshev in 1979. The recommendations by the specialists formed the basis of the practical activities of all the subdivisions of river transportation.

The material-technical base of river transportation is developing with a consideration of the need to prolong the navigational period. At the present time the river fleet has at its disposal powerful line icebreakers of the "Kapitan Chechkin" type, icebreakers with a capacity of 1320 and 440 kVt, and the LLp-18 and LPS-14 icebreaking and ice-clearing attachments. We are constructing transport ships that, on the basis of their technical features, are capable of

navigating in broken ice 20-30 centimeters thick; and we will be getting diesel freighters of the "Sibirskiy" type, which can be operated in ice up to 0.7 meters thick.

The supplementing of the river fleet with new powerful icebreakers has made it possible to begin the planned work of breaking up the ice cover on the basic main routes in the European part of the USSR; to begin shipments of cargo for the national economy 10-15 days earlier than the dates for the natural clearing of ice from those water routes; and to end them 2-3 weeks after the ice has begun to form; as well as assuring the guaranteed return of the entire transport fleet to the ports of registry after the end of the navigation season.

In 1981, as a result of the forced opening up of the rivers and the favorable weather conditions, the shipments of salt from Akhtubinsk were begun 14 days earlier than in 1980; petroleum from Aktau, 15 days earlier; sand from Kalinin to Moscow, 8 days earlier; and crushed stone from Zhigulevsk, 5 days earlier. Every year, during the prolonged period of navigation, river transport ships more than 15 million tons of cargo for the national economy. At the same time, the experience of using the icebreakers and the work of the transport fleet under icy conditions indicates that shipments of cargo during that period can be increased if there is a sufficient quantity of icebreaking means and icebreakers of increased capacity. If the necessary number of powerful line icebreakers were available, the opening up of the ice cover in the Volga-Kama basin could be carried out in more compressed periods of time, one could prevent the formation of ice jams, could break them up promptly, and prepare the storage facilities at the reservoirs for the reception of ice from the river sectors.

An especially critical shortage of icebreakers is felt in the North-West basin when opening up the Volga-Baltic Canal, the BBK [White Sea-Baltic Canal], and Lakes Ladozhskoye and Onezhskoye. For that reason alone, the handling of cargoes in the direction to the northwest and back is annually delayed by 10-15 days, as compared with the technically possible time periods. Consequently, the periods of operation by ships in hauling coal from the Volga ports to Moscow and Leningrad, iron-ore concentrates from Kandalaksha to Cherepovets and the Kama ports, apatites from Medvezh'yegorsk and a number of other important sectors could be increased by 15-20 days, by having at one's disposal the sufficient quantity of icebreaking means.

It would seem that, with the activation of the new series of shallow-displacement icebreakers that are being constructed at the present time in Finland for the MRF and with the redistribution of the existing ones, it will become possible to resolve on a broader scale the questions of prolonging the navigation season and to establish earlier guaranteed dates for the acceptance and shipping of cargoes during the springtime in the steamship agencies of the central and northwestern basins with a consideration of the technical specification of the transport fleet and the capabilities for the work of the ports, the handling equipment, and the hydraulic structures, and also with the availability of the necessary depths on the navigational paths and the sluice thresholds.

The prolonging of the navigation season is also one of the reserves for increasing the handling capacity of the hydraulic structures.

The route workers, jointly with the scientific and planning and designing organizations, have developed and are carrying out a program of projects to design and install devices that assure the prolonging of the navigation season at the sluices of the Unified Deepwater System, as well as projects for the navigational situation under conditions of the prolonged navigation season.

At the navigational hydraulic structures of the Volga-Balt, Volga, and the Canal imeni Moskva, devices are being introduced in a planned manner, which make it possible for the sluices to operate when ice is present and when the air temperatures is below zero. At the present time, at the structure of the Volga-Baltic Water Route imeni Lenin (VBVP), work has been carried out to install the first phase of a complex that includes the removal of the ice from the case sections of the double-wing gates and from the grooves of the working gates in the upper head; the maintaining of the clearances in front of the gates; and the heating along the shape of the seal, the hauling elements, and the width of the gates. Similar devices are being made at one of the ends of the Volga sluices and at most of the sluices at the Canal imeni Moskva, but according to a time schedule that involves the lack of rated compressors. The experience of operating the sluices during the period of the prolonged navigation season indicates that they can operate continuously thanks to the introduction of these devices for a period of 20-30 days.

However, it should be noted that the equipping of the sluices with devices to prolong the navigation season is being delayed because of the shortage of compressors, heating elements, stainless-steel pipes, and steam and water fittings.

In order to improve the orientation of the navigators when operating under icy conditions, dike beacons are being installed at reservoirs in the Volga-Kama basin, and additional orientation-markers on the banks in the North-West basin.

The carrying out of the measures to prolong the navigation season is contributing to the increase in the overall volume of cargo shipments. However, it must be noted that, when planning the operation of the icebreaker and transport fleet, in a number of instances, especially during the spring season, insufficient consideration is taken of the physical and the forecasted ice situation. This leads to the unjustified increase in the volume of icebreaker operations and to idle-time periods at plants by the transport ships that have already been handed over for operation. For example, in 1980-1981 individual ships in the Volgotanker Steamship Agency remained idle 10-12 days each before departing. In the spring of 1981 the total time for ship anchorage at the Gorodets SRMZ [Ship-Repair and Machine Plant] came to 117 ship-days. At the Kama Steamship Agency the idle time of the self-propelled fleet for this reason alone was in 1980 and 1981, respectively, 462,100 and 549,600 tonnage-days.

In a number of steamship agencies, the first unloaded trips are large in distance and in duration. In the spring of 1980 in the SZRP [Northwestern River Steamship Agency] they came to 735,000 tonnage-days, with 27 million tonnage-kilometers of run.

These periods of idle time, first trips, and also the moorings of the ships during the nighttime hours while waiting for icebreakers, the reduction of the speed of

traveling through the ice, and the reduction in the intensity of the loading operations have been leading to a reduction of the gross productivity of the fleet by as much as 50-70 percent as compared with the average level for the navigation season. In the Volgotanker Steamship Agency, for example, during the first ten-day period of April, with the normal development of ice phenomena, the producitivity of the tankers in the gross 24-hour periods constitutes 60 percent, during the first two ten-day periods, 70 percent, and during the entire month 85 percent of the average annual figure; in the Volga United Steamship Agency, the productivity of the self-propelled freight fleet constituted, respectively, 50, 60, and 70 percent. In November the gross productivity of that group of ships varied from 60 percent under heavy ice conditions to 85 percent under comparatively favorable ones. Therefore it is not by accident that the central operations group for the prolonging of the navigation season, when considering this important question, instructed the steamship agencies to carry out a detailed analysis of the actual use of the fleet during the prolonged period of navigation during the past three or four years and to submit recommendations for planning and accounting for the gross productivity by types of fleet during the early-spring and late-spring periods separately. That work must be carried out by the steamship agencies within the established deadline.

The increase in the effectiveness of the operations to prolong the navigation season greatly depends upon the improvement in the organization of the handling process during that period, and upon the efficient limits of navigation with a consideration of the ice conditions that change from year to year.

In the projects that were executed previously by GIIVT and by LIVT [Leningrad Institute of Water Transportation], on the basis of a comparison of the qualities of the ships working under icy conditions, the technical condition of the hydraulic structures and the equipment of the water routes with natural factors (thickness and strength of the ice, water level, air and water temperature), a determination was made of the technically possible dates for the beginning and ending of navigation for various types of transport ships. In 1981 the dates were refined and presented in a more convenient form for time-responsive use with consideration of the forecasts of ice phenomena. By way of an example, the table shows the computed dates for the beginning and end of the navigation on water routes with the normal dates for ice formation and the clearance of ice from them, for the group of fleet with ice reinforcement.

The computed dates for navigation under time-responsive conditions must be adjusted according to the deviation from the norm in the forecasted dates for the beginning of the ice phenomena, as forecasts are received from the agencies of Goskomgidromet.

In addition to the establishment of the efficient dates for navigation in the ice, it is necessary to improve the organization of the movement of ships during the prolonged period of the navigation season. For that purpose GIIVT, operating on the basis of a production order from the Main Adminstration of Shipments and the Fleet, MRF, and with the participation of that administration, developed a Statute Governing the Organizing of the Work of the Ships in the RSFSR Ministry of River Fleet, which went into effect with the 1982 navigation season.

Water-route sectors	Beginning of navigation		End of navigation	
	Type of ice navigation			
	accompanied	independently	independently	accompanied
Petrozavodsk - Voznesen'ye	17.4	8.5	17.12	25.12
White Sea	12.4	1.5	15.11	4.12
Cherepovets - Perebory	13.4	1.5	20.11	1.12
Uglich - Perebory	7.4	22.4	30.11	7.12
Rybinsk - Yelnat'	4.4	12.4	27.11	16.12
Yelnat' - Gorodets	6.4	20.4	26.11	7.12
Gorodets - Lyskovo	5.4	10.4	25.11	10.12
Lyskovo - Cheboksary	9.4	22.4	2.12	16.12
Cheboksary - Kamskoye Ust'ye	7.4	15.4	26.11	6.12
Kamskoye Ust'ye - Naberezhnyye Chelny	9.4	19.4	26.11	5.12
Kamskoye Ust'ye - Togliatti	9.4	22.4	26.11	7.12
Togliatti - Balakovo	12.4	18.4	6.12	16.12
Balakovo - Saratov	8.4	14.4	12.12	24.12
Saratov - Volgograd	28.3	12.4	12.12	24.12
Naberezhnyye Chelny - Chaykovskiy	14.4	23.4	3.12	14.12
Chaykovskiy - Perm'	12.4	21.4	5.12	16.12

The statute cites the structure for the operations agencies for administering the work of the fleet during this period, and their basic functions. It provides for the assignment of fleet traffic directors in the most complicated sectors from among the mentor-captains, icebreaker captains, or experienced captains of transport ships. In order to improve the hydrometeorological support of the work of the basin operations group, with the coordination of the territorial administrations for hydrometeorology and the control of the environment, the basin administrations of the route (canals), and the steamship agencies, groups for providing information on the ice conditions are created. In the appendix to the statute there is a list of the basic measures for preparing and organizing the shipments of cargo during the prolonged period of navigation. The precise execution of the principles contained in the statute will make it possible to raise the level of organization of the shipping process during the prolonged period of navigation.

The chief factor that determines the possibility, limits, and scope of navigation in the ice is the state of the transport fleet, its state of adaptation to working under those conditions. The damages to the hulls and the propeller and rudder complexes of the ships that occurred in 1979 and 1980, especially in ice jams and during movements of the ice, confirm the need to know and keep records of the data concerning the reinforcement of the ships. A considerable amount of work in this direction is being carried out by LIVT and GIIVT specialists, who, in particular are conducting real-life tests of transport and icebreaker ships. However, it should be noted that the results of that work have not yet found broad practical application. The Requirements for Transport Ships for Guaranteeing Their Operation Under Icy Conditions and With Below-Freezing Air Temperatures, which were prepared by LIVT, have not yet been introduced.

In our opinion, a suitable form for the submittal and use of information concerning the quality of the ships could be the ice rating cards for standard ships, which have become widespread in the MRF. The ice rating card indicates the safe speeds for the ship's movement while independently navigating and when following behind an icebreaker under various icy conditions; diagrams for evaluating the desirability of having the ship accompanied by an icebreaker and of choosing the operating mode for the power unit; as well as recommendations for navigators. The knowledge of this information will make it possible in a more precise manner to plan and carry out effective and safe work by ships in the ice.

For purposes of preventing damages, and for increasing the safety of navigation under these conditions, a Provisional Instruction Manual and Recommendations have been prepared and are currently in effect. It should be noted that a considerable number of damages to ships have been received because of the lack of discipline on the part of the navigators or their lack of knowledge concerning the appropriate actions and tactics in navigation through the ice. The high professional level, discipline, and careful training of the navigational complement for every voyage through the ice are the basis for the safety of the operation of the fleet during the prolonged period of navigation.

In addition, in order to reduce the accident rate it is necessary to improve the icebreaker and hydrometeorological support of navigation.

During recent years the placement and the operation of the icebreaker means have been carried out in accordance with plans developed at the MRF and the steamship agencies for each icebreaker campaign. The steamship agencies have accumulated a considerable amount of experience in organizing the icebreaker operations in specific sectors of the route. At the same time, the questions of improving the technological methods of icebreaker operations with the application of powerful icebreakers and icebreaker trains with attachments require detailed working out. The necessary aid to steamship agencies in this regard should be rendered by the scientists at our institutes.

Support of the fleet and the shore organizations with timely and forecasted hydrometeorological information is carried out by way of the agencies of Goskomgidromet. Specialists at USSR Gidromettsentr and the territorial administrations of the hydrometeorological service carry out a considerable amount of work to improve the timely servicing of navigation during the prolonged period of navigation. However, the received current information (data concerning the air and water temperature, ice phenomena, thickness and strength of ice cover) and the forecasted information (dates for opening up and clearing of ice from sectors of the route, beginning of ice formation and the establishment of stable ice, of building up of thickness and decrease of the ice strength) does not yet completely satisfy the needs of the steamship agency or the route administrations. First of all this pertains to the accuracy of the long-term forecasts and the dates for the occurrence of ice phenomena. For individual sectors of the route, the deviation from the actual dates, as compared with the forecasted date , constituted in 1980 and 1981 more than nine days. But the justification rate for the short-term forcasts transmitted to the steamship agencies in the form of refinements and recommendations reaches 90-95 percent.

The lack of accurate information about icy conditions, as well as the certain distrust toward forecasts, accompanied by the shortage of icebreaker means, is leading to unproductive idle time for the fleet and for the ship-handling structures, both during the initial and during the final periods of the navigation season.

The forecasts that are prepared are of a large-scale nature, that is, they encompass sectors that are considerable in area. As a result, experience that deserves attention is that of the Petrozavodsk Hydrometeorological Observatory and the Karelian Territorial Administration of Goskomgidromet, which conduct ice itinerary measures of the thickness of the ice on Lake Onezhskoye from an amphibious jeep, an air sled, and "Buran"-type snowmobiles, and carry out paratrooper surveys from MI-1 and KA-26 helicopters, landing specialists on the ice and carrying out measurements of its thickness for the purpose of establishing routes over which the icebreakers can travel.

When such operations are being conducted, a measure of considerable intrest is the air ice-measurement survey, which is carried out from a helicopter or airplane with the use of radar apparatus. The expansion and practical use of air ice-measurement surveys at the present time are being restrained because of the insufficient number of instruments, the considerable cost of executing the operations, the limitation of the survey by the meteorological conditions, and the lack of methodological principles for using the obtained information. Therefore the air ice-measurement surveys that were carried out in 1980 and 1981 to establish the thickness of the ice in the Volga basin proved to be insufficient effective as a consequence of the imprecise organization of the transmittal of their results to the steamship agencies and to the icebreakers, and the lack of experience in using such information. The ice-measurement survey with the use of radar equipment should be continued, and its results should be used to adjust the work plans of the icebreaker means and thedates for activating the transport fleet.

Simultaneously it is necessary to organize the collection and transmittal from the ships of the objective information concerning the ice conditions on the water routes. For these purposes GIIVT has developed the Handbook for Organizing Ice Observations on Internal Water Routes; and a Brief Aid for Ice Navigation. These documents provide methodological recommendations for evaluating the characteristics of the ice cover and for organizing the observations. However, it is insufficient simply to have these documents at one's disposal. It is necessary to organize procedures by which the navigators learn the skills needed to carry out the observations.

Information concerning the ice conditions in the basin should be summarized in the form of a reference aid that is convenient for timely use in the shipments and fleet-traffic service and in the other subdivisions of the steamship agency. As applicable to the central and northwestern basins, such a reference aid has been prepared by GIIVT and has been provided to the Volga United Steamship Agency and to Volgotanker.

The work being carried out by MRF to prolong the navigation season on the internal water routes has reconfirmed that this is a complicated, combined problem that requires the resolution of a large number of questions pertaining not only to the operation of the subdivisions of river transport, but also of other branches of the national economy.

The breaking up of the ice cover leads to the cessation of the functioning of numerous pedestrian, animal-transport, and motor vehicle crossings over the ice, which are of great importance for the economic life of the areas along the rivers.

In order to guarantee the safety of operating the crossings under icy conditions, and in order to plan and carry out the icebreaker operations and to provide for the movement of the transport fleet, it is necessary to have the precise interaction between the transportation organizations and the local Soviets of People's Deputies, and the prompt informing of the population in the areas along the rivers concerning the beginning of the icebreaking operations and of through navigation.

In addition, during recent years at number of reservoirs in the Single Deep-Water System, one has noted a considerable amount of winter drop and the lowering of the water levels during the springtime period below the levels minimally necessary for the operation of the fleet. The insufficient depths at the sluice thresholds make it impossible to provide for the prompt extension of icebreaker operations or the organization of the through movement of the ships on the basic river mainlines. For example, in the spring of 1976, 1979, and 1980, the shallow depths on the sluice thresholds of the Kuybyshev Hydroelectric Center led to a delay of the through navigation by 15-20 days. One has also observed instances of a sharp drop in the navigational level on the reservoirs. For example, starting in early October 1981 the level of the Rybinsk and Kuybyshev reservoirs dropped to the markers that are close to the nominal navigational ones.

As a result there arises the need for re-examining the Basic Principles for the Use of Water Resources of Reservoirs with a consideration of the work performed by river transport under conditions of the prolonged navigation season. It would appear to be necessary for USSR Minvodkhoz, jointly with Minenergo, MRF, and the other interested ministries and departments, to re-examine the operational modes of the hydroelectric power stations.

The accumulated practical experience and the scientific research that has been carried out have indicated that the basic trend for the immediate future is the complete use of the period of physical navigation by all the assigned ships and the organizing of shipments of cargo through the ice in the technically possible time periods of the early-spring and late-spring periods. It would also appear to be advisable to continue the accumulating of experience in the winter shipments of cargo on individual lines with a limited length of routes and with the most favorable hydrometeorological conditions and a considerable cargo flow.

These trends were taken into consideration when developing and carrying out a program of scientific-research, experimental-design, and practical operations aimed at prolonging the navigation season during the current five-year period, which program is supposed to guarantee the fulfillment of the tasks assigned to river transport in that area by the 26th CPSU Congress.

5075
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TO CHANGE THE DISTRIBUTION OF EXPENSES

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[Article by Candidate of Economic Sciences I. Skobeleva (LIVT) [Leningrad Institute of Water Transportation]]

[Text] In river transportation at the present time the indirect expenditures constitute more than 10 percent of the total amount of costs of basic operational activity. They include the expenses for maintaining the roadbed and auxiliary-service fleet, the communication centers, the rayon administrations, and the administrations of the steamship agencies, as well as the general operational costs. According to their economic content a large number of these expenditures are linked with servicing, as well as administering the basic operational activity and industry.

The economically substantiated charging of costs for various types of activity of river transportation to a considerable degree determines the reliability of a number of economic indicators, and primarily the net costs of shipments.

From 1950 through 1980 the methodology of distribution of indirect expenses for various types of work changed several times. The changes were aimed at increasing the accuracy of determining the net costs of individual types of operations. However, that task should not be considered to be finally resolved.

The intensive development of the port and wharf management, the qualitative and quantitative change in the composition of the fleet and the organizing of its shore servicing, the development of the comprehensive servicing of the transport fleet, the protection of the environment, and the improvement of the organization of administrative labor led to a substantial change in the composition and structure of the indirect expenses and the need to change the procedure for accounting for them and distributing them with the purpose of the more accurate determination of the net costs of individual types of operations and the locating of reserves for reducing those net costs.

The question that is the most acute one is the question of improving the accounting and distribution of the expenses for the maintenance of the auxiliary-service ships. During recent years that type of fleet has been developing intensively, and the expenditures for maintaining it have also been rising. For example, during 1970-1980 as a whole for MRF [Ministry of River Fleet] they doubled (with an increase in the expenses for the transport fleet by 72 percent

and an increase of passenger and cargo turnover of 39 percent). At the present time the expenses for maintenance of the auxiliary-service ships occupy the largest share in the overall sum of expenditures to be distributed -- more than 23 percent.

In the practical situation the steamship agency uses the method of direct charging of expenses for the auxiliary-service fleet for individual types of operations depending upon the functions to be executed by the particular ship. The accounting report (Form B-3) takes into consideration and plans only that part of the expenses to be charged basically for shipments. Expenses for maintaining the auxiliary-service fleet that services other types of operations (reloading, subsidiary-auxiliary and industrial production) are not isolated in the existing records and are reflected in the estimate of expenses for the appropriate types of operations. In this regard, in the accounting report (Form B-3) it is desirable to indicate the overall sum of expenses for the auxiliary-service fleet, with a distribution by expenditure items and types of operations.

At the present time the methodology of distribution of ships in the auxiliary-service fleet and the corresponding expenses among the types of operations, which methodology is used in the steamship agencies, should not be considered sufficiently substantiated or correct, and this, to a considerable degree, is linked with the lack of precise instruction manuals concerning the charging of expenses for the auxiliary-service fleet for various types of activity. For example, in a number of steamship agencies the expenditures for the maintenance of the harbor fleet (the most numerous group of auxiliary-service ships), as a rule, are completely charged to shipments, although the the harbor fleet also services other types of operations. A practice which, in our opinion, is incorrect is the inclusion in the net costs of shipments of the the expenses for the maintenance of ships whose functions are linked with the protection of the environment.

The distribution of expenditures for each ship in the auxiliary-service fleet should, in our opinion, be carried out in conformity with the sphere of its direct use in the transportation process. For example, the expenses for the maintenance of bunker craft should be charged to shipments if they are servicing the transport fleet; to reloading operations if they are servicing floating cranes; or to subsidiary-auxiliary production if they are delivering fuel to the bunker bases. The expenditures for the maintenance of wharf landings should be charged to loading-unloading operations if the landing is used as a mooring; to subsidiary-auxiliary production if it serves as a hotel; and should be excluded from the basic operational activity if it is leased for use as a floating store or if it serves for the collection of trash and bilge water.

Expenses for the maintenance of harbor ships should be charged to shipments or reloading operations; the expenditures for the fleet that services the docks and slips, to the industrial activity; expenditures for the fleet that services crossings, to the subsidiary-auxiliary production; that which services the BPU [shore production unit], to shipments; VOKHr [militarized guard], should be excluded from the operational expenses and charged to paid services; and other expenses (maintenance of agitation launches, ships in the navigational inspectorate), to reloading operations or auxiliary production.

It would seem to be desirable to expand the specific list of expenses to be excluded from the operational expenses and charged to profits and losses, primarily charged to ships that are fulfilling the functions of protecting the environment.

The implementation of the proposed distribution of expenses for the auxiliary-service fleet will lead to a decrease in the expenditures charged to shipments, by 10-15 percent.

Expenditures for maintenance of the roadstead fleet of the steamship agencies are distributed into shipments and reloading operations in conformity with the shares that have been established by the instruction manual. However, the low share of expenses that is charged for reloading operations (20-35 percent) does not reflect the true use of the roadstead fleet and leads to the unjustified increase in the total amount of costs charged to the net costs of shipments. An analysis of the functions carried out by the roadstead fleet, and of the data pertaining to its operation, attests to the need to increase the share of the expenses charged for reloading operations to 35-50 percent. The differentiation of that share for individual steamship agencies is influenced by the different nature of the use of the roadstead fleet.

The expenses for the maintenance of communication centers and administrations of the steamship agencies are distributed among the individual types of activity of river transport in conformity with the shares that are established by the instruction manual and that are uniform for all steamship agencies of the MRF.

Analogous expenses in industry (with the estimating of the net costs of individual types of output) are distributed proportionally either to the wages of the production workers, or to the total amount of wages and expenditures for the maintenance and operation of the equipment. It would seem to be desirable to use this method also in river transportation when distributing the expenses for communication centers and administrations of steamship agencies among the individual types of operations. The distribution of the expenditures should be proportional to the total amount of the wages of the production workers and the navigating complement, and also the depreciation of the fixed production assets. The level of these expenses depends upon the extent of the live labor that is involved in production and the fixed production assets (first of all, the rolling stock, reloading technology, equipment at the industrial enterprises and subsidiary-auxiliary production entities). In proportion to the increase in the number of production workers and navigating complement, there is a complicating of the functions of administration of the enterprise, and this has an effect upon the number of workers in communication and in administration, and makes increased demands on their level of proficiency and influences the increase in the corresponding expenses.

The supplementing of the fixed production assets, the use of highly productive equipment and rolling stock, the improvement of the technological schemes for shipments and reloading operations also increase the demands made on the overall and functional administration, and this, in the final analysis, leads to an increase in the groups of expenses that are being considered.

Thus, the operation of ships designed for mixed navigation -- "river-sea" -- including those in foreign communication, with which the steamship agencies are being substantially supplemented, has caused the necessity of organizing, accounting, and planning those shipments, the introduction of voyage planning, and the improvement of the material incentives for the crews on such ships. This has led to an increase in the number of workers in administration and to the creation of a new department -- the foreign-shipments service department -- and that has contributed to an increase in the expenditures for maintaining the administrations of the steamship agencies. The organization and increase in the shipments in the "river-sea" mixed-navigation ships, which have been a factor in increasing the cost of the fixed production assets and the number of navigating complement, also led to an increase in the expenses for communication centers that service the long-distance shipments on those ships.

It should be noted that the use, as the basis for distribution, of only the expenses for wages will lead to a substantial distortion of the net costs of individual types of operations (activity) of the river transport. This is linked with the different level to which the workers have been provided with equipment and with funds. Thus, in shipments and in reloading operations the considerable level of mechanization of production and automation of a number of production functions leads to an absolute freeing of the workers, to their high level of provision with funds in these types of operations, and to considerable expenditures linked with the renovation of the fixed production assets (depreciation) in the overall expenses for shipments and reloading operations. The share of the expenditures for depreciation in the overall expenses for shipments constitutes as a whole for the MRF 33 percent (1980) and is constantly growing. There has been a corresponding decrease in the share of expenses for the wages of the navigating personnel with deductions for social security (from 36 percent in 1965 to 28 percent in 1980).

The share of expenses for depreciation in the overall sum of expenditures for reloading operations is also relatively high and is constantly increasing: since 1965 it has increased by 8 percent and in 1980 came to 27 percent. Corresponding the share of expenses for wages dropped from 33 percent in 1965 to 24 percent in 1980.

Thus, the rapid rates of scientific-technical progress in the fleet and in the ports have led to a change in the structure of the expenses to be charged to shipments and reloading operations. At the present time the percentage of expenditures for depreciation is higher than for wages.

The subsidiary-auxiliary activity of river transport is typified by a considerably lower degree of mechanization of labor, and this is one of the reasons for the higher level of expenditures linked with live labor. Thus, the expenditures for wages with deductions for social security constitutes in this area approximately 40 percent on the average for the MRF, and for depreciation, 2/5 of that (less than 15 percent).

A relatively low percentage of expenses for depreciation in the overall net costs (8 costs) also typified the industrial production of the MRF. The expenditures for wages here are twice as high as for depreciation, but are also relatively low. This is linked with the existence and the high percentage in

the net costs of industrial output of the expenses for raw materials and basic materials.

An analysis of the data cited in the table indicates that the distribution of the indirect expenses for the maintenance of the communication centers and administrations of the steamship agencies among the types of operations only proportionally to the wages paid to the production workers would lead to an increase in the share of those expenditures to be charged to the subsidiary-auxiliary activity and industry. As was already mentioned, that is economically incorrect, inasmuch as the extent of the expenses to be distributed, whichare linked with the types of activity being considered, is determined not only by the volume of live labor, but also by the amount of fixed production assets that are involved in production.

Expenditure elements	Distribution of overall sum of direct expenses by types of operations, %			
	shipments	reloading operations	subsidiary-auxiliary activity	industry
Wages (with deductions for social security)	50.8	14.4	18.9	15.9
Depreciation	62.3	18.7	8.2	10.8
Total of wages and depreciation	56.2	16.4	13.9	13.5
Overall sum of direct expenses	46.1	16.3	12.7	24.9

But the distribution of expenditures among these types of operations in proportion to the overall sum of direct expenses would lead to a substantial increase in the amount of the distributed expenditures to be charged to industrial production. That is linked with the existence, as part of the net costs of industrial production, of a large share of expenses for raw and basic materials, which, practically speaking, are lacking in the expenditures for the basic operational activity.

Thus, the expenses for the maintenance of communication centers and administrations of steamship agencies should, in our opinion, be distributed among the individual types of operations in proportion to the sum of the expenditures for the wages paid to production workers (navigating personnel) with deductions for social security and for depreciation.

The structure of distribution of these elements of direct expenses by types of operations is different in the various basins. For example, the Kama Steamship Agency, which is to a considerable degree a cargo-forming one with a large volume of reloading operations, is characterized by relatively higher expenditures for wages and for depreciation, to be charged to reloading operations. For steamship agencies (Northwestern, White Sea-Onezhskoye, Western, Irtysh, Western-Siberian) that are characterized by high rates of development of shipments, the expenditures for wages and depreciation which are charged to shipments are relatively high.

As a result of the peculiarities that have been indicated, the distribution of expenses for the maintenance of communication centers and administrations of steamship agencies among the types of activity should be carried out in conformity with the shares that have been established by the LIVT studies and that are differentiated by groups of steamship agencies.

The general operational expenses of the steamship agencies unite the costs that are linked with the training of personnel, the protection of labor and safety measures, scientific-research projects and economic research, and the payment of the operations performed by VTs [computer centers] and FMS [computer accounting centers]. These expenditures for formed both in the administrations of the steamship agencies (the centralized part), and in the ports. The centralized general operational costs are distributed among the types of operations in conformity with the shares that are uniform for all the steamship agencies and that have been established by the instruction manual. The general operational expenses of the ports are distributed among the local shipments, the reloading operations, and the subsidiary production in proportion to the direct expenditures for those types of activity.

The group of expenses being considered should be distributed according to the same principle as the costs for communication and administration of the steamship agencies -- in proportion to the total expenditures for the wages paid to the production workers (navigating personnel) and the depreciation by types of operations. In order to distribute the centralized part of the general operational expenses, LIVT has developed shares that are differentiated by various steamship agencies and groups of steamship agencies. For the ports the analogous shares must be established by the steamship agency itself.

The implementation of the proposed procedure for the distribution of indirect expenses of the river transport will lead to a change in the structure of distribution of the total sum of these expenditures among the types of activity. The share of the indirect expenses that are charged to the net costs of shipments will decrease; the share for other types of operations in the basic operational activity will increase; and the share for the output of industrial enterprises, practically speaking, will remain unchanged. As a result the share of the expenses in the overall sum of expenditures for shipments that will be distributed will drop from 13.2 percent (1980) to 11.8 percent; in the overall sum of expenditures for reloading operations will increase from 6 to 7.5 percent. This will lead to a decrease in the net costs of shipments on the average for MRF by 1.4 percent, and to an increase in the net costs of reloading operations by 1.5, and will increase the reliability of those indicators.

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OCEAN AND RIVER

BRIEFS

KARAKUM CANAL NAVIGATION--Water transportation has become the main transportation form for many almost inaccessible areas...of the desert. One hundred forty motorships, barges and boats now course along the 500-kilometer navigable segment of the Karakum Canal. This flotilla annually transports hundreds of thousands of tons of various cargoes and equipment. The fleet formed on the Karakum Canal imeni V. I. Lenin has provided relief for the railroad and has freed air and motor vehicle transport from expensive, time-consuming, and at times dangerous trips across the desert. It is planned that in the near future the canal will be made navigable for a distance of 820 kilometers. Then, on the sides of the ships navigating among the sandy dunes, the port of registry will be revealed in large letters--Ashkhabad, a city located hundreds of kilometers from the nearest large river. [Text] [Moscow KOMSOMOL'SKAYA PRAVDA in Russian 22 Aug 82 p 1]

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